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CHLOROCOCCALES (ALGAE: CHLOROPHYCEAE) FOUND IN AQUATIC ENVIRONMENTS OF THE COLOMBIAN AMAZON BASIN

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Resumen

Se registran por primera vez para la Amazonia colombiana 10 taxones de Chlorococcales del fitoplancton y ticoplancton encontrados en algunos lagos del río Amazonas y del río Cotuhé, afluente del río Putumayo. *Nephrocytium limneticum* y *Sorastrum americanum* var. *americanum* son primeros registros para Colombia.

Palabras clave: Algas, Amazonia, Chlorococcales, Colombia, Taxonomía.

Abstract

Ten taxa of algae belonging to the order Chlorococcales are recorded for the first time from the Colombian Amazon basin. Two of these, *Nephrocytium limneticum* and *Sorastrum americanum* var. *americanum*, are recorded for the first time in Colombia.

Key words: Algae, Amazon basin, Chlorococcales, Colombia, Taxonomy.

Introduction

The present work adds to the known inventory of the algae present in epicontinental aquatic environments of the Colombian Amazon basin. This study is the first to deal with the order Chlorococcales (Chlorophyceae) for this area, for which the following groups have been previously studied: the desmids (Zygophyceae, Desmidiaceae and Gonatozygaceae) by Duque & Donato (1993, 1994, 1995, 1996a, 1996b) and Duque & Núñez (in press); euglenoids (Euglenophyceae) by Duque (1995); blue-green algae (Cyanophyceae), green algae (Chlorophyceae, Volvocales) and desmids (Zygophyceae, Desmidiaceae) by Duque & Núñez (1997); and finally the chrysophytes (Chrysophyceae) by Vigna & Duque (unpublished).

Materials and Methods

The samples (Table 1) make up part of the collection "Ficoteca Amazónica", located at the Universidad Nacional de Colombia in Leticia. The field and laboratory methodologies are referenced elsewhere (Duque & Donato 1993, 1995, Duque & Núñez 1997). Sant'Anna & Martins (1982), Komarek & Fott (1983), Sant'Anna (1984), Hegewald & Silva (1988) and Comas (1991, 1996) were used for the taxonomic determination of species. For the presence of the taxa in Colombia, the database of the Instituto Amazónico de Investigaciones - IMANI, Universidad Nacional de Colombia (Duque, unpublished), was reviewed. All of the species represent first records for the Amazon basin of Colombia.

Table 1. Samples studied in the present work (P: Phytoplankton; T: Tycoplankton).

REGION	SAMPLE NUMBER	LOCATION	COMMUNITY	DATE
Río Cotuhé	0201	Lago Quinina	P	31 Jul 1994
	0206	Quebrada Yagaré	P	11 Aug 1994
	0417	Lago Quinina	P	1 Nov 1994
Río Amazonas	0079	Lago Pozo Hondo	P	14 Feb 1992
	0099	Lagos de Yahuarcaca	T	20 Mar 1992
	0107	Lagos de Yahuarcaca	P	29 Apr 1992
	0130	Lago Resaca	T	30 Jul 1992
	0136	Lagos de Yahuarcaca	P	25 Jun 1992
	0285	Lago de Tunda	P	16 Aug 1994
	0292	Lagos de Yahuarcaca	P	3 Feb 1994
	0299	Lagos de Yahuarcaca	P	3 Feb 1994
	0300	Lagos de Yahuarcaca	P	3 Feb 1994
	0333	Lago Resaca	P	13 Nov 1994
	0334	Lago Resaca	P	13 Nov 1994
	0384	Lagos de Yahuarcaca	P	2 Jul 1994

Results

The following list presents the taxonomic descriptions and sample numbers for ten Chlorococcales encountered in the Colombian Amazon basin.

Actinastrum hantzschii Lagerh.

Star-shaped cenobium with 7-8 fusiform cells of 13-21 x 3-4 um each, joined by one of their ends (Fig. 1a). Samples 0130, 0206, 0300. In Colombia cited as *A.* cf. *hantzschii* by Losada (1992).

Kirchneriella lunaris (Kirchn.) Möb.

Cenobium with 8-12 cells of 5 x 7 µm each. Cells with tapering ends forming a U-shaped sinus (Fig. 1c). Sample 0300. Recorded in Colombia by Losada (1992), Ramírez (1992) and Useche (1994).

Kirchneriella obesa (W. West) Schmidle

Cenobium with 6-9 cells. Round cells with rounded ends forming a V-shaped sinus 3-7 µm in diameter (Fig. 1d). Samples: 0300, 0384, 0417. Recorded in Colombia by Ramírez (1992) and Ramírez & Díaz (1994).

Nephrocytium limneticum G. M. Smith

Cenobium with reniform cells 14 x 6 µm, slightly curved and rounded apices (Fig. 1e). Sample 0292. This species has a wide distribution (Europe, Asia and North America); this is the first record in Colombia.

Pediastrum duplex Meyen var. ***duplex***

Cenobium with 16 cells 9-17 x 6-11 µm. H-shaped cells with two projections at the tips Cells (Fig. 2a). Samples 0079, 0084, 0292. It has a cosmopolitan distribution. In Colombia this species has been found in lakes and reservoirs of the páramo, Andean and lowland regions around the Magdalena and Orinoco rivers by Molina (1983), Donato et al. (1987), Duque & Donato (1988), Donato (1991), Losada (1992), Ramírez (1992), Useche (1994), Guamán et al. (1995) and López (1996).

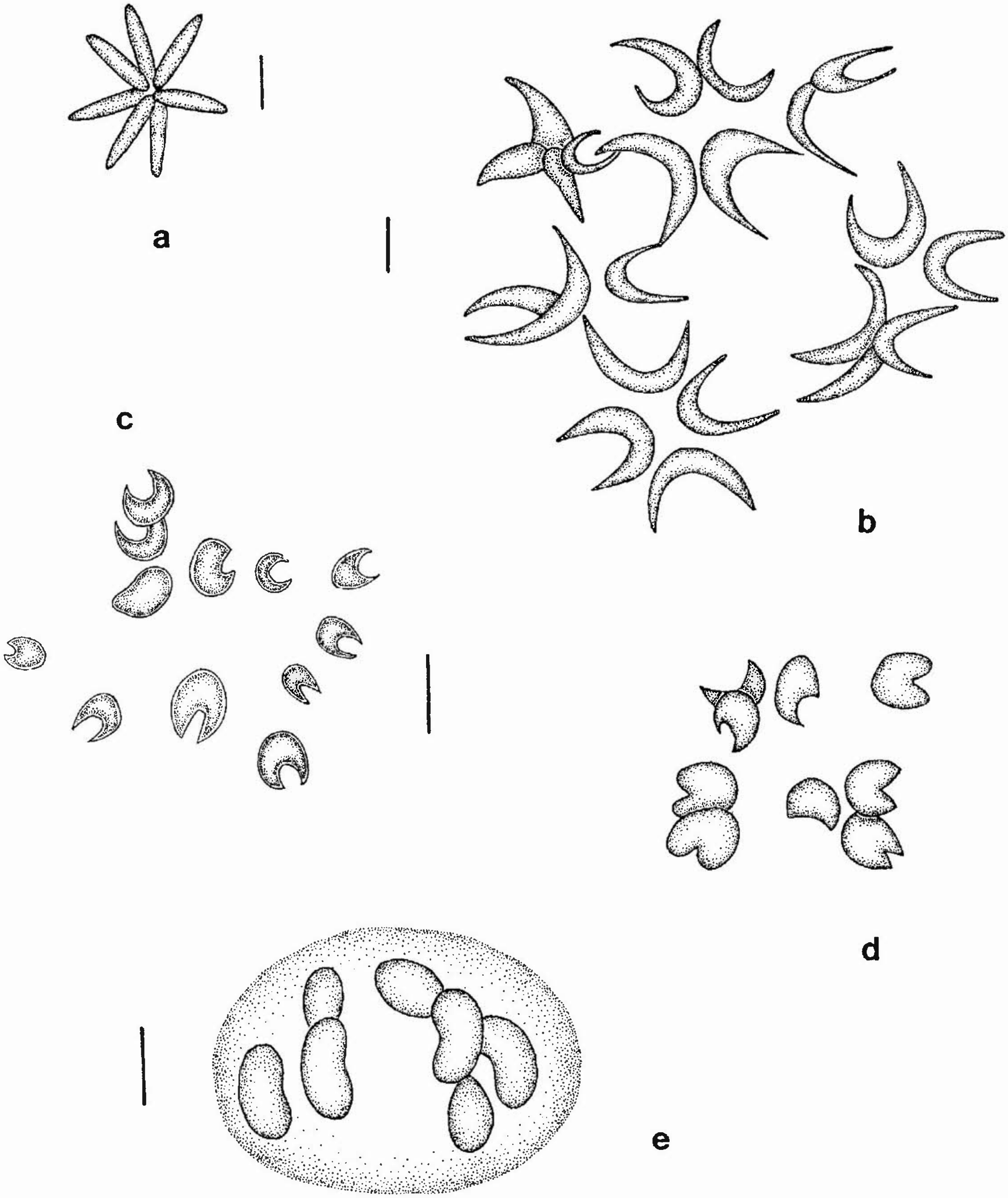

Figura 1. Species of Chlorococcales recorded in the present paper. a. *Actinastrum hantzchii*; b. *Selenastrum rinoi*; c. *Kirchneriella lunaris*; d. *Kirchneriella obesa*; e. *Nephrocytium limneticum*. The scale is 10 µm.

Pediastrum simplex Meyen var. ***simplex***

Cenobium with 16 cells 13 x 9 µm each. Outside cells with one projection; internal cells triangular with spaces between them (Fig. 2b). Samples 0079, 0099, 0285. It has a cosmopolitan distribution. In Colombia it has been recorded by Duque & Donato (1988), Ruiz et al. (unpublished), Andrade et al. (1992), Ramírez (1992) and Vidal (1995).

Scenedesmus acuminatus (Lagerh.) Chod. var. ***acuminatus*** f. ***acuminatus***

Cenobium with eight elongated-fusiform cells 18-30 x 5-6 µm each, joined in a markedly alternating pattern (Fig. 2c). Samples 0136, 0300, 0333, 0334, 0388. It has a wide distribution. In Colombia it has been cited as *S. acuminatus* by Donato et al. (1987), Duque & Donato (1988), Ruiz et al. (unpublished), Ramírez (1989, 1992), Ramírez & Díaz (1994) and López (1996).

Scenedesmus quadricauda var. ***quadricauda*** (G. M. Smith) Chod.

Cenobium with four elongated cells 12-21 x 5-11 µm each. External cells with two spines each, 12-16 µm, joined laterally (Fig. 2d). Samples 0299, 0300, 0417. It has a cosmopolitan distribution. In Colombia It has been observed in lakes and reservoirs of the páramo, Andean and lowland regions around the Magdalena and Orinoco rivers by West (1914), Donato et al. (1987), Duque & Donato (1988), Donato (1991), González & Donato (1991), Andrade et al. (1992), Losada (1992), Ramírez (1992), Ramírez & Díaz (1994), Useche (1994), Guamán et al. (1995) and Prada (1995).

Selenastrum rinoi Kom. et Com.

Sickle-shaped cells 9-15 x 3-4 µm, strongly curved, with gradually taperings ends (Fig. 1b). Samples 0201, 0292. Recorded in Colombia by López (1996), who cites it as *Ankistrodesmus bibraianus*, a synonym of *S. rinoi* (Comas 1996).

Sorastrum americanum (Bohl.) Schmidle var. ***americanum***

Cenobium with eight pear shaped cells with two projections each. The cells measure 20 x 13 µm each without projections and 28 um long with projections (Fig. 2e). Sample 0107. The species is found in Africa, South America, Europe and the Caribbean. Recorded here for the first time in Colombia.

Key to the species Chlorococcales of the Colombian Amazon

1. Elliptical cenobium with cells distributed unevenly in mucilage. **2**
1'. Non-elliptical cenobium with cells not surrounded by mucilage. **5**
2. Cells slightly curved, with rounded apices. . . . . ***Nephrocytium limneticum***
2'. Cells strongly curved. **3**
3. Cells separated. **4**
3'. Cells joined by their convex sides. . . . . ***Selenastrum rinoi***
4. Cells with rounded apex. . . . . ***Kirchneriella obesa***
4'. Cells with pointed apex. . . . . ***Kirchneriella lunaris***
5 (1'). Cells fusiform joined at their apices. . . . . ***Actinastrum hantzschii***
5'. Cells not fusiform, not joined at their apices. **6**
6. Cenobium of 4-8 cells. **7**
6'. Cenobium of eleven or more cells. **8**
7. Oblong cells laterally joined, with terminal spines. . . . . ***Scenedesmus quadricauda var. quadricauda***
7'. Cells with pointed apices without spines, alternately joined. . . . . ***Scenedesmus acuminatus***
8 (6'). Polygonal cells with projections on outer faces of cenobium. **9**
8'. Pyriform cells with 1-4 spines on outer faces of cenobium. . . . . ***Sorastrum americanum***
9. Cells with one projection. . . . . ***Pediastrum simplex***
9'. Cells with two projections. . . . . ***Pediastrum duplex***

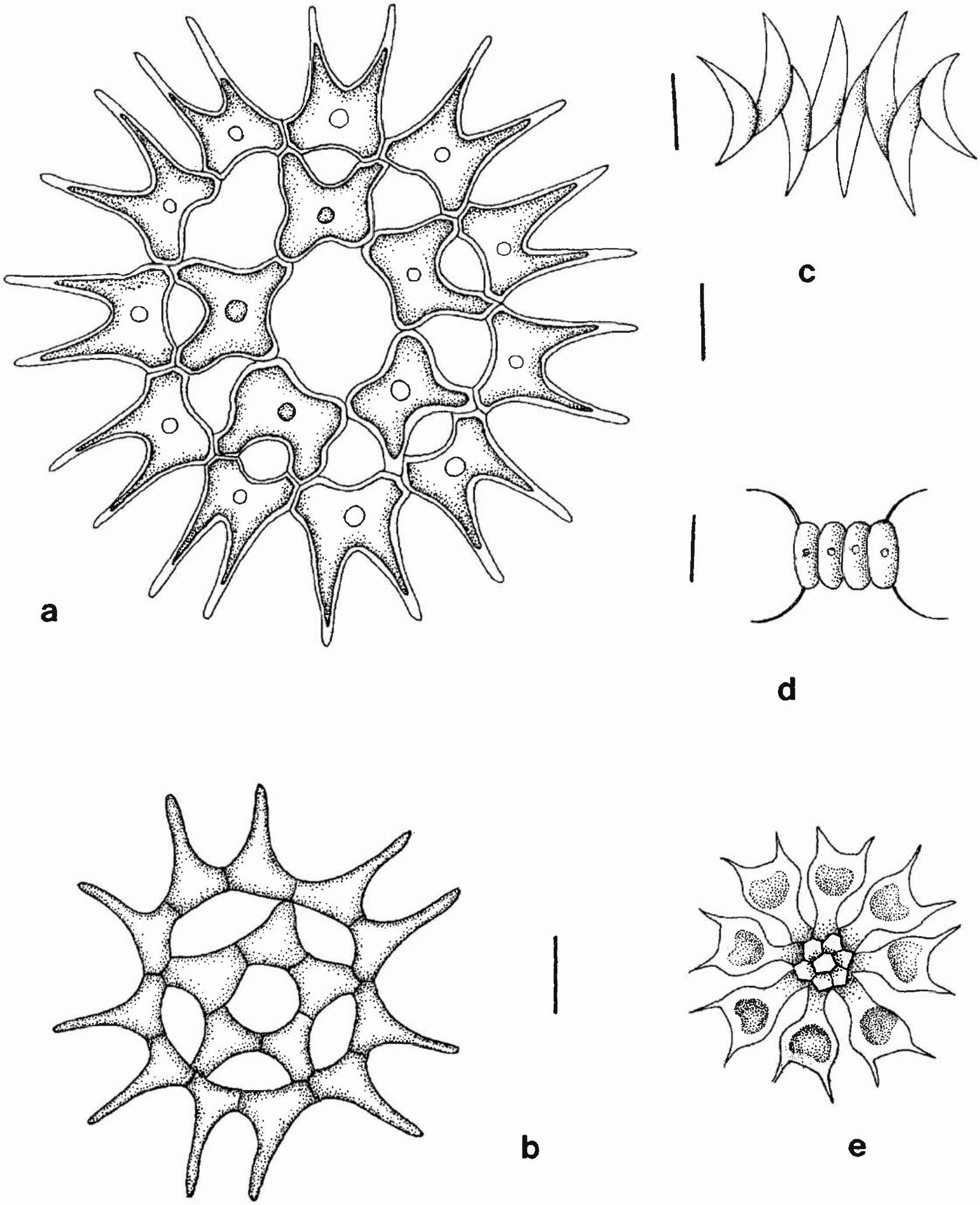

Figure 2. Species of Chlorococcales recorded in the present paper. a. *Pediastrum duplex* var. *duplex*; b. *Pediastrum simplex* var. *simplex*; c. *Scenedesmus acuminatus* var. *acuminatus* f. *acuminatus*; d. *Scenedesmus quadricauda* var. *quadricauda*; e. *Sorastrum americanum* var. *americanum*. The scale is 10 µm.

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